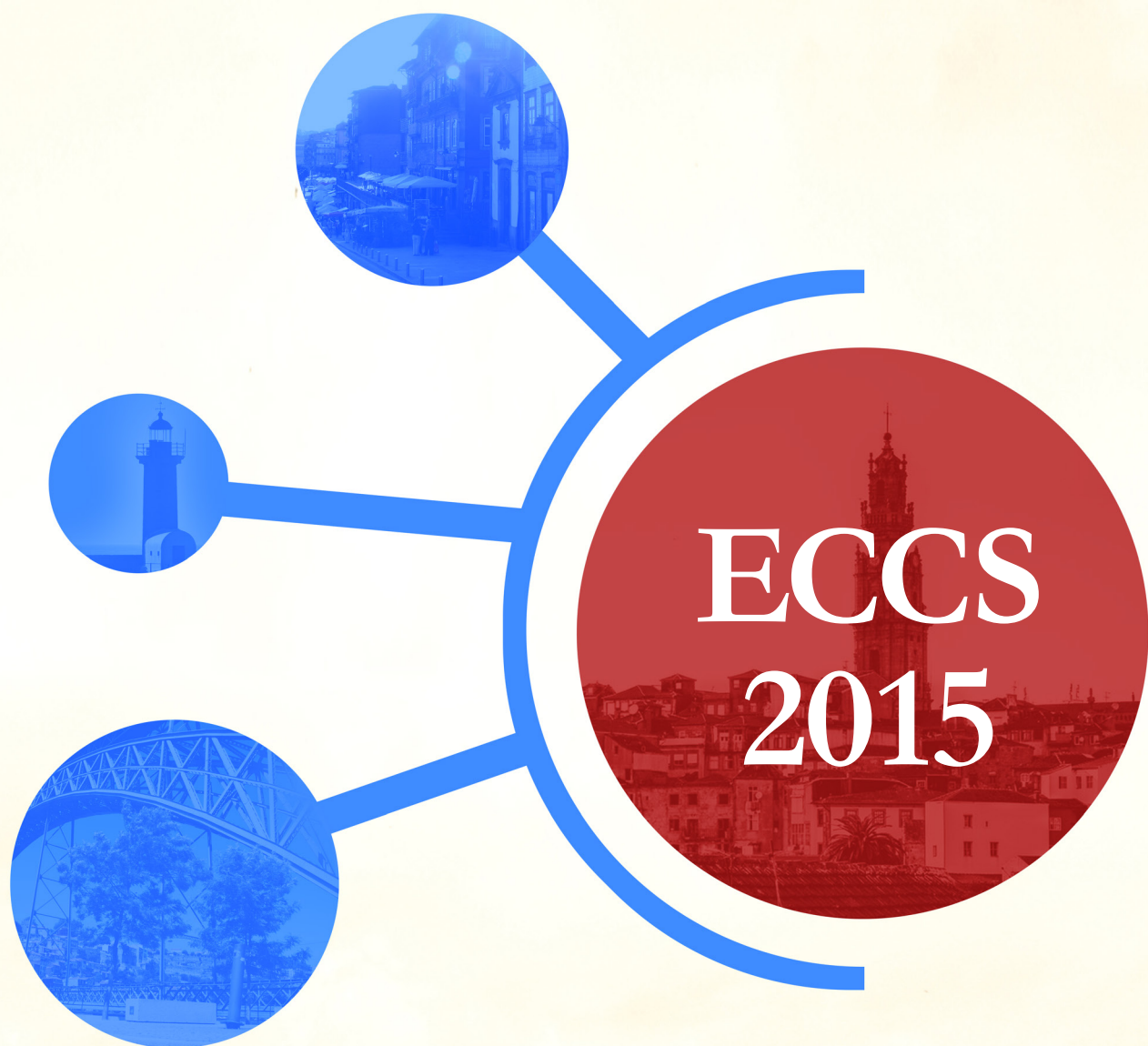


Curriculum Studies

Policies, perspectives and practices



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The teaching of mathematics and the external evaluation of schools: A study involving teachers from 1st to 6th grade²

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The processes and practices of Portuguese education and training are becoming increasingly integrated in agendas globally structured, and whose area of influence is placed in the common frame of European Union policies and transnational organisms such as OCDE (Pacheco, 2009). Evaluation has been acquiring, in the last decades, a critical role, extrapolating its importance beyond the field of education (Afonso, 2010). The emphasis given to schools evaluation derives from two trends that affect most European countries: the decentralization of means and the creation of national goals and of levels of school results (Eurydice, 2011).

Departing from the political and economic analysis of globalization on education and making a critical approach to the policies of sharing (Takayama, 2008), it is aimed to analyze the mediation of the pressure applied by curricula policies of homogenization and standardization of results (Afonso, 2012; Santiago, Donaldson, Looney & Nusche, 2012) and their influence on teachers of Mathematics.

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This quantitative study, involves a questionnaire survey to teachers from 1st to 6th grade and primary teachers, in which it is ascertained how the model of external evaluation, implemented in Portugal since 2006, has been contributing to the creation of concrete consequences in school results, namely on the standards of evaluation, and on the dominance of summative tests in Mathematics, taking in account the curricular changes and teaching changes.

Keywords: Curricula, Mathematics, Exams, Quality, Standards, Accountability.

1.Introduction

Evaluation is projected by diverse eyes and interfaces, by concomitant paradigms, models and theories, by differentiated practices which bear new meanings and questions (Pacheco, 2011, p.3). Standing out as a system capable of boosting a new identity, assessment is a technique of biopower, or subjugation in the sense that Foucault (2013) gives to education and health policies, thus contributing to the existence of fear “in a context where short term pressures are increasing, individuals live with the fear of constant assessment and of being unable to live up to the company’s expectations” (Lipovetsky & Serroy, 2010, p.46).

In contemporary societies (Pacheco, 2011, p.9 quoting Gil, 2009) evaluation is pointed out as a universal method to form identities which are essential to modernization, extreme competence, and clarification of subjectivity as evaluation will give and will measure both reward and merit (Ibid).

Curricula and learning while seen as a way to knowledge lead evaluation to be centered on knowledge, even if it takes in account the historical background of education and training policies, thus the evaluation practices are centered on the contents, on the specific goals, and on activities and professional skills (DeKetele, 2008).

Evaluation no longer has a summative or formative component and becomes an unfinished flexible and itinerant project, answering in a more direct way to an evaluation based on standards (Stake, 2006), valuing mainly the personal dimension and the social dimension – the evaluation by the other (Pacheco, 2011).

In the last decades Portugal has seen the expansion of the teaching system and mass education, which not only led to a growing worry about quality and evaluation issues(OCDE, EU, UNESCO), but also to an increase of deeper systems of accountability and liability, which has a notorious impact on the creation of national education policies (IGE, 2009).

For these reasons, the basic principles of national legislation recommend that evaluation and quality control should be applied to the whole education system, including private and cooperative system, as well as promote the improvement, efficiency and effectiveness, along with qualified information for decision making. Therefore, schools’ autonomy is related to liability, accountability and with external evaluation results (IGE, 2013).

The presentation of external or internal evaluation results always has consequences or effects which may contribute to improve the quality or, on the contrary, to demotivate professionals, mainly those who stand for a constructivist approach. This approach redefines the development of quality and evaluation, putting them at the

service of a decentralized and professionalized service, in which schools accept that the results of their self-evaluation can be questioned by the results of external evaluation (Thurler, 1998).

The processes and practices of Portuguese education and training are increasingly integrated in globally structured agendas, and their area of influence is placed in the common frame of European Union policies and transnational bodies such as OCDE (Pacheco, 2009).

Departing from the political and economic analysis of globalization on education and making a critical approach to the policies of sharing (Takayama, 2013), it is aimed to analyze the mediation of the pressure applied by curricula policies of homogenization and standardization of results (Afonso, 2012, Santiago & Donaldson, 2012) and their influence on the role of local players, namely the teachers of Mathematics.

Evaluation has been acquiring, in the last decades, a critical role, extrapolating its importance beyond the field of education (Afonso, 2010). The emphasis given to schools' evaluation derives from two trends that affect most European countries: the decentralization of means and the creation of national goals and of levels of school results (Eurydice, 2011).

In Portugal, during the 90's, schools were under Central Administration and were evaluated as organizational units. Then, this model evolved toward the decentralization of public administration and toward an increase of the autonomy given to schools, which came to show their critical value.

The foundations necessary for the birth of several initiatives both of external evaluation and schools' self-evaluation were created (Clímaco, 2010). The Observatory for School Quality (1992), and later the Project Quality XXI, the Project of Integrated Evaluation in Schools (1999), and the Program AVES (2000) carried by Manuel Leão Foundation are good examples of such initiatives.

In these initiatives, the influence of efficient schools, which raised so much interest amongst political education authorities and education actors, is very noticeable (Lima, 2008).

The publication of the Law on the System of Evaluation of Education and of Non-Higher Education – Law No 31/2001 of 20th December – sets a new path for the evaluation of schools in Portugal.

A double evaluation is advocated now – external evaluation and self-evaluation. These two types of evaluation are often pointed out as having opposite lines of thought – self-evaluation heading towards organizational development and external evaluation focusing more on accountability – despite the complementarity aims that the two might have for attaining higher and better levels of school performances (Ministry of Education, 2006).

Deriving from the above mentioned law and from a pilot experience taken place in 2006, a program for External Evaluation of Schools was implemented in Portugal, under the purview of GIES (General Inspectorate of Education and Science), whose first evaluation cycle was finished in 2011.

Amongst the countries within OCDE, schools' evaluation tends to be considered as a “generator of change, as it contributes to decision making in the teaching system, to the distribution of resources and to an improvement of school learning (Santiago, 2010). According to this author, this tendency is mainly due to greater autonomy granted to schools, which, in most of the cases, explains a higher emphasis on accountability, along with a higher importance attributed to “market mechanisms as a form of accountability” (Idem, 2010, p. 29).

Therefore, the system of accountability entails relations and interdependencies, in which evaluation, accountability and liability are included, also taking into consideration principles such as justice, transparency and the right to information (Afonso, 2011).

Great accountability improves the present as it shapes the future. It invests in, grows and circulates professional capital throughout the system. Combine internal and external accountability, and we will get higher performance, greater self and group responsibility for results, and more commitment to sustaining and enhancing all students' learning, development and success (Fullan, Rincon-Gallardo & Hargreaves, 2015, p.14-15).

The schools' academic performance of students in mathematics is currently evaluated through two big international surveys: the TIMSS and the PISA (Eurydice, 2011). Generally speaking, the TIMSS aims to evaluate "what the students know", whereas the PISA tries to ascertain "what the students can do with the acquired knowledge". The collected data has three aspects: the expressed curriculum defined by a country or education system, the implemented curriculum which teachers actually teach, and the acquired curriculum, or what students have learnt (Mullis, Martin & Foy, 2008, p. 25). The PISA isn't directly focused on a specific aspect of the curriculum; instead it attempts to evaluate how 15-year-old students can apply their math knowledge in everyday life, thus giving emphasis to math literacy.

The results of these studies have become increasingly important throughout the years, to the extent of causing deep changes in the world education policies. This is an impressive fact, since the comparison between Systems of Education through the means of rankings and their interpretation is leading to educational policies defined in a normative mode (Bulle, 2011, p.503).

In this perspective, the participant countries are invited to compete against each other in order to redefine their educational systems based on the results obtained (Idem, p.503).

One of the indicators that attracts public interest the most is the relative rank of the average tests results in every country, creating pressure so that teaching practices of countries with better performance levels are adopted by all countries (Steiner-Khamsi, 2004; Takayama, 2013).

Mathematics as a subject has been gaining an increasingly significant role in the students' education, since it improves skills and competences, such as problem solving, argumentative skills, formulation and test of hypothesis, communication skills and accuracy of observation, which are critical matters that will facilitate inclusion as well as personal and professional success in an increasingly competitive world (NCTM, 2007; Roth & Radford, 2011). Hence:

"In a world of permanent changes, those who understand and succeed in learning mathematics will significantly have bigger opportunities and better options to build their future. Competence in mathematics opens doors to more productive futures. The lack of this competence keeps these doors closed... All students should have the opportunity and the needed support to learn significant mathematics with deepness and understanding. There is not a conflict between equity and excellence" (NCTM, 2000, p.50).

In most European countries the curricula of mathematics presents itself as a formal document of a normative nature, which specifies the topics to be learnt and describes study programs and their contents, as well as

teaching, learning and evaluation materials that should be used (Kelly, 2009). One of the chief goals of teaching reforms is the improvement of education patterns and, consequently, of students' academic performance.

One of the main reasons underlying the most recent updates was the inclusion of an approach based on learning results, defined in broad terms as the knowledge and competences needed to prepare a young person for a life of personal, social and professional well-being (Psifidou, 2009). The curricula based on learning results focuses on the learning processes and aims to be more broadening and flexible than the traditional subject based curricula.

The use of learning results on the curricula can also be related to the new concepts of ruling and managing quality. Some people believe that the creation of regulations based on learning results is a way of assuring quality in teaching, and thus conferring more autonomy to schools and teachers to build learning programs that will respond to their students' needs (Cedefop, 2008).

In Portugal, after the changes introduced to the curriculum in 2008, the present program became more explicit in what concerns the students' expected performance in each mathematical issue and in the cross curricular competences related to this subject (Eurydice, 2011).

Most European countries are trying to assess the effectiveness of the implementation of curriculum using different means, but curriculum effectiveness is mainly assessed through the national evaluation of students. In almost every educational system, standard tests and national examinations take place, one of their aims being to evaluate curriculum effectiveness (Eurydice, 2011).

There aren't many specific surveys about the way a curriculum is taught in each school, but usually this type of information is collected under the general framework of external evaluation of schools. However, the results of schools' self-evaluation are the second source of data more commonly used by countries to assess the effectiveness of their curricula (Idem, 2011)

2. Method

An empirical quantitative study was carried out (Moreira, 2006), departing from the conclusions obtained through the analysis of reports and from the revision of topic-related literature also using a survey by questionnaire (Tuckman, 1994; Ghiglione & Matalon, 1997), developed with items distributed by Likert scale, targeting math teachers from first to sixth grades of primary education from schools in a Municipality in the north of Portugal, whose reliability was tested by another empirical study (Marques, 2013).

The sample (n=51) was randomly selected from schools ranging from Primary and Elementary Education (1st to 6th forms) from a school grouping in the north of Portugal, in which most respondents are female (92%) and the rest are male (8%). The majority of the respondents' ages in the age range from 30 to 45 years old (45%), followed by respondents over 45 years old (37%), and those under 30 there represent only 17%. Most of them possess a university degree (86%), and the rest of them have a master's degree (14%). Regarding the subject group, Elementary (5th and 6th forms) is the predominant one (65%), and the others belong to Primary School (35%). Concerning the number of years of service, the majority have between 11 and 20 years (45%), followed by those with more than 20 years (28%), and finally those with more than 10 years (27%).

3. Preliminary Results

The results of the survey are organized in two tables, in descending order of mean obtained in the following areas: Curricular changes (table 10) and Teaching Changes (table 11).

Items	Minimum	Maximum	Mean	Standard Deviation
The results obtained by students on national tests contribute to the construction of the school social image.	2	5	4.39	0.635
National math tests should take place in the end of each studies cycle (4 th , 6 th and 9 th grades).	2	5	4.35	0.976
The Mathematics Plan contributes for a larger teaching cooperation among teachers.	3	5	4.33	0.622
The creation of rankings enhances competitiveness amongst schools.	3	5	4.22	0.702
Curricular goals correspond to final goals.	1	5	4.10	0.855
Curricular goals define the contents that students should learn.	2	5	4.01	0.787
The schools with the best results in math should be an exemple of good teaching practice for other schools.	2	5	3.98	0.969
External evaluation of schools has contributed to a better curricular articulation among school departments.	2	5	3.84	0.784
The formation of rankings helps competitiveness among teachers of subjects with national examinations, including math.	2	5	3.84	0.857
National examinations have contributed to the creation of a yearly math common global test, for every class belonging to the same school grade.	2	5	3.82	0.713
The evaluation of students trough national examinations creates in the teachers the fear of professional failure.	2	5	3.78	0.702
National examinations have contributed to the creation of equal tests for all classes belonging to the same school grade.	2	5	3.73	0.635
The results of international examinations (PISA, TIMSS, for example) contribute to a bigger importance of math in the curricular plans of Primary Teaching.	3	5	3.67	0.589
External evaluation of schools has contributed to the creation of a yearly math common global test, for every class belonging to the same school grade.	2	4	3.59	0.572
Support lessons should only be provided for students who do not present a significant deficit in their learnings.	2	5	3.56	0.760
Students' evaluation through national examinations has helped me improve my practice as a teacher.	2	5	3.51	0.758
Intermediate tests an effective management tool to improve students' results.	2	5	3.49	0.857
Students from primary education give more value to math due to the existence of national examinations in the end of the cycle of studies.	2	5	3.47	1.007
External evaluation of schools has contributed the creation of equal tests for all classes belonging to the same school grade.	2	4	3.43	0.640
Test-based students' evaluation contributes to the individualization of the teacher's work.	1	5	3.43	0.922
The Mathematics Plan contributes to the improvement of math school results of students from primary education.	2	5	3.31	0.860

As a math teacher I feel responsible for my students' results in national examinations.	1	4	3.22	1.026
I feel comfortable with the existence of a test-based students' evaluation.	1	5	3.12	0.973
The curricular goals replace the program.	1	4	2.25	1.055

Table 10: Curricular changes

Items	Minimum	Maximum	Mean	Standard Deviation
Homework contributes to the improvement in student's school results in math.	3	5	4.43	0.575
As a math teacher I feel pressured to teach my students to be prepared for national examinations.	2	5	4.27	0.723
School teaching support lessons for students should be directed for the subjects with national examinations.	3	5	4.24	0.473
Teaching for tests results contributes to an improvement in the students' school results.	2	5	3.94	0.858
Math teachers are increasingly teaching for the results in national examinations.	2	5	3.90	0.922
The student is the main responsible for his school performance.	1	5	3.90	0.922
As a math teacher I feel responsible for the results that my students get on the internal evaluation during the school year.	2	5	3.82	0.767
The social and economic background is the main responsible for the students' performance.	2	5	3.75	1.017
The marks obtained in intermediate tests should be included in the students' final evaluation for the internal evaluation.	3	5	3.69	0.616
External evaluation of schools has contributed to a bigger cooperation among math teachers in the classroom teaching activity planning (preparing materials...)	2	5	3.69	0.948
External evaluation of schools has contributed to the creation of a yearly math common global test, for every class belonging to the same school grade.	2	5	3.55	0.702
External evaluation of schools has contributed to a bigger cooperation among math teachers in the creation of tools of internal evaluation, including correction and marks criteria.	2	5	3.47	0.833
External evaluation of schools has contributed to a bigger cooperation among math teachers in the preparation of teaching contents (defining strategies, sequence ...).	2	4	3.45	0.673
External evaluation of schools has contributed to a bigger cooperation among math teachers in lesson planning.	2	4	2.43	0.755
Support lessons should only be provided for students who do not present a significant deficit in their learnings.	1	4	3.20	0.849
Teachers are the most important factor in the students' performance.	2	4	3.10	0.964
As a math teacher I still teach the same way as before, regardless of national examinations.	2	4	3.02	0.905
Summative tests results must be the most influent componente in the students' evaluation.	1	5	3.0	1.249

As a math teacher I still teach the same way as before, regardless of external evaluation of schools.	2	4	2.86	0.825
Test-based students' evaluation contributes to the objectivity in the evaluation.	1	5	2.86	1.184
As a math teacher I value more the summative evaluation than the formative one in the final evaluation of students.	1	4	2.63	1.095
Math results on national examinations are a reflection of the students' actual learning.	1	4	2.22	0.923

Table 11: Teaching changes

By analyzing the questions related to the topic of curricular changes (table 1), some specific conclusions may be drawn: the respondents agree on the following ideas: the school results that students achieve in national examinations have an influence on the schools' social image ($X=4.39$; $D.P.=0.635$); national examinations of mathematics should happen at the end of each cycle of studies ($X=4.35$; $D.P.=0.976$); the Mathematics Plan contributes to a higher level of teaching cooperation among teachers ($X=4.33$; $D.P.=0.622$); the creation of rankings contributes to competitiveness among schools ($X=4.22$; $D.P.=0.702$); curricular goals correspond to final goals ($X=4.10$; $D.P.=0.855$), and curricular goals set the contents that students should be learning ($X=4.01$; $D.P.=0.787$).

In what Teaching Changes are concerned (table 2), the results show that the respondents agree on the following ideas: homework contributes to the improvement in student's school results in math ($X=4.43$; $D.P.=0.575$); math teachers feel pressured to teach for national examinations ($X=4.27$; $D.P.=0.723$); support lessons in schools should be directed for the subjects that have a national examination ($X=4.24$; $D.P.=0.473$); teaching with the purpose of preparing the students for tests contributes to an improvement of school results ($X=3.94$; $D.P.=0.858$); math teachers are increasingly teaching to prepare their students for national examinations ($X=3.90$; $D.P.=0.922$); the student is the main responsible for his/her school performance ($X=3.90$; $D.P.=0.922$), and math teachers feel responsible for the results that their students get on the internal evaluation during the school year ($X=3.82$; $D.P.=0.767$).

The respondents' indecision on the evaluation, which was calculated through the correlation coefficient, can be seen on the effects of summative evaluation on the students' final school marks, as well as on the objectivity of a test-based evaluation.

4. Conclusions

The respondents of this study, math teachers from 1st to 6th grade, show agreement on the effects the external evaluation has on their practice and also that the achievements outlined on the reports of external evaluation are rhetorical, although they agree to the fact that external evaluation is giving an important contribution to the teaching directed towards tests as well as to the standardization of results. The idea that the results obtained on National Examinations along with the existence of rankings contribute to competitiveness among schools can be seen on the results of this survey; however, there is higher agreement around the idea that the results on math national examinations may not be a reflection of the actual learning done by students, or that their influence may cause an increase of competition among teachers.

The concept of objectivity of a test-based evaluation is a source of large uncertainty by the respondents, who answered in very contradictory ways.

The majority of the respondents admit that there is pressure to teach for national examinations, that the support lessons should be directed for subjects with national examinations, that the students are the main responsible for their school performance, and that teaching for tests contributes to an improvement in school results.

Nevertheless, there is indecision about the idea that curricular goals are a replacement for the program, which can be seen through a very diverse range of answers. Also, there is no agreement on how comfortable teachers are with a test-based evaluation of their students, and that they are responsible for the results of their students on national examinations.

Indecision is also present in what concerns the influence of schools' external evaluation along with international tests (PISA, TIMSS, for instance) contributing to the importance given to math in the curricular plans of Primary and Elementary School and for the teaching practice of the respondents (cooperation among teachers, building materials, activity planning, what contents to teach...).

Looking at the results, it must be pointed out that the majority of the respondents considered that the school results obtained on national examinations contribute to the social image of school, and that math national examinations should be done at the end of each cycle of studies, despite the thought that these examinations haven't contributed so far for an improvement of the teachers' practice nor do they reflect the actual learning done by students.

In the study final results, some issues should be addressed: what purpose may examinations have at the end of a cycle, if they do not reflect the actual learning of students? What is their influence on the quality of learning as well as on the actual teaching practice?

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